

poorly, thousands of acres of plantations where trees did not survive have to be replanted. All these shortcomings in the present system are enormously costly and occur on all forest lands, without regard to ownership. Even the most rudimentary calculations show that an increase in survival rates of just 1 or 2 percent will justify a considerable research effort. Also, the costs of effective reforestation research are quickly recouped because the benefits are realized immediately.

Resistance to Change. Another barrier to the implementation of scientific reforestation is resistance to change. It is likely, however, that the driving forces for more efficient, effective reforestation described earlier will overcome such resistance as the benefits of new procedures become obvious.

Benefits of Change. Our collective stake in scientific reforestation is enormous. Our country is presently the largest importer of wood in the world. This is a completely unnecessary drain on our economy. The United States is easily capable of growing all the wood it will ever need if cutover lands are promptly reforested, if idle lands are reforested, and if the resultant young stands are properly managed. It has only to grasp the new technological tools at hand and have the discipline and will to change to become fully self-sufficient in forest products in the 21st century.

Managing Future Forests for Wilderness and Recreation

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National opinion surveys have documented a trend of increased public interest in, and support for, wilderness and recreation management of our forest resource. This shift toward a larger role for wilderness and recreation also will be speeded by increased efficiency in commodity production from forests, especially timber production. New knowledge and technology will enable the Nation to meet needs for timber and other commodities on fewer acres and with less impact on the environment.

Increased Diversity

Future forests will provide a wide variety of recreational opportunities in settings that range from primitive to highly developed and include everything in between. The in-between settings, in particular, will need to be better defined and more intensively managed. Such settings include non-wilderness lands for uses such as hiking, horseback riding, bicycle riding, ski touring, trailbiking, hunting, and fishing. These settings will help meet important needs that are relatively neglected now and provide needed alternatives to recreational use of wilderness.

The whole range of opportunities will be planned and managed within the Recreation Opportunity Spectrum framework developed over the last decade by Forest Service research scientists. The distribution of opportunities across the spectrum will be better

balanced and more clearly articulated. As a result, alternatives will be clearer to the public, and they will be better able to match opportunities to their needs and desires.

Shift from Wilderness Designation to Management

Although debate will continue over appropriate uses of specific tracts of land, the current emphasis on wilderness allocation (determining which lands will be designated wilderness) will decrease in the future. As values and technology change, ideas about what lands should be wilderness will continue to evolve. But more and more of the major wilderness designation decisions will have been made by the end of this decade.

Management of lands selected as wilderness will become critical as emphasis shifts away from the wilderness designation process. Protection of natural wilderness conditions and provision of opportunities for high-quality wilderness experiences will be essential to do what was intended by wilderness designation.

Operation of Natural Processes. Allowing dynamic natural processes to operate freely, with minimal human interference, is critical to perpetuate natural conditions in wilderness. Fire, in particular, needs to play its natural role more fully, and this will require continued advances in wilderness fire-management planning. Research on fire regimes and fire management will be needed to support future planning. More research also will be needed if manager-ignited fires are to become a sensitive tool to complement lightning fires in areas where such natural fires must be limited.

Limiting Recreational Visitor Impacts. Also essential is limiting

impacts to the wilderness environment caused by recreational visitors. We must build upon and extend current knowledge of the impact process, of the relative vulnerability of different types of locations, and of how different visitor actions affect resources. Research so far has shown that limiting amount of use is often less effective in managing wilderness than changing the type of use, user behavior, and distribution of use.

Limits of Acceptable Change.

The Limits of Acceptable Change (LAC) approach to managing wilderness carrying capacity recognizes the need to focus on ecological and social conditions resulting from use, rather than just on the amount of use. Using LAC, managers take a variety of actions to respond to identified specific problems in contrast to focusing on controlling the amount of use. LAC, very recently developed by scientists based on past research, will need testing and further development, but it offers a practical way of dealing with carrying-capacity concerns. LAC will likely become the general approach to managing recreational use of wilderness in the future.

High-Quality Recreation

Management of recreational use, not only in wilderness but all across the recreation opportunity spectrum, will require more cooperation between managers and visitors. Information and education are keys to involving the public more in protecting resources and reducing user conflicts in the areas they visit and treasure.

Information Could Limit Regulation. New technology can make information about alternative areas to visit more readily available to the public. Computers have already been used successfully on an experimental basis to display information to help



Research will enable backpackers and other National Forest visitors to enjoy beautiful scenery even as surrounding areas are intensively managed for timber production and other forest-related commodities.

people choose places to go based on their interests and preferences.

Regulations will become less common and less obtrusive. Educating our visitors about proper behavior on public lands and communicating effectively with them will be the foundation for making them partners in management, not passive recipients of authoritarian regulation and control.

The public also can become more involved in management planning, helping set goals and select strategies for achieving them. Initial efforts in this direction in the management of the Bob Marshall Wilderness in Montana are promising.

Use of Fees. Fees for using public land for recreation will become more common. If fee systems are properly developed, they can enhance cooperation between the public and managers. If most fees are used to protect and manage areas people care about,

support for these charges is likely. Fees can become an effective way for the public to help achieve their goals. Fee income might also highlight the growing value the public places on recreation and wilderness.

Integrating Uses

Commodity uses of future forests, such as timber production and grazing, can be more effectively integrated with many types of outdoor recreation. Visual resources (scenery) also can become more harmoniously related to commodity uses. Research must develop better ways to create and enhance recreation and scenic values while managing timber and other forest commodities, so that managers can go beyond mitigation of adverse effects. Silvicultural techniques, for example, will be developed to enhance scenery and recreation opportunities while managing for timber production. Improved knowledge



Recreational use of National Forest Lands not set aside as wilderness is likely to increase over the coming decades; settings that are neither primitive nor highly developed will see more intensive management.

can lead to more positive relations between commodity production and recreation, making them complementary rather than competitive. Better identification of key recreation values and sites is one essential element of more effective integration among uses.

More Stable Use?

Many types of outdoor recreation are growing more slowly than in the past. Hunting, fishing, wilderness use, and many other activities appear to have plateaued after decades of rapid growth. Newer activities, such as snowmobiling, cross-country skiing, and hang gliding, grew very rapidly at first but now have leveled off. Changing population and social structure suggest that recreational use in the future may be more stable than in the past.

If use stabilizes, managers will have an opportunity to solve important problems and make progress rather than just struggling to keep up with escalating patterns of use. Some new activities, however, probably will develop to surprise us.

Visitor Expectations Higher

The number of recreationists may not be skyrocketing in the future, but visitors are likely to be more discriminating. Their expectations for quality are likely to change and generally become higher, as the average visitor becomes more experienced and committed. Most types of use will still grow, although more slowly than in recent years.

Continuing substantial use by visitors seeking quality experiences will provide managers of recreation and wilderness in future forests with a difficult challenge. Meeting it successfully will require continuing advances in scientific knowledge and technology.

Protecting Forest Resources From Disease

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Nations that fail to protect their forests risk serious economic and social consequences. That is why conservationists work hard to protect forests from overexploitation and unwise use.

Many people do not know, however, that forest tree diseases can be even more devastating than misuse. Diseases carelessly introduced from Europe and Asia have caused billions of dollars of lost revenue from America's forests, and modern forest-management practices have worsened the impact of some of our native tree diseases. Perhaps the worst examples of introduced diseases are chestnut blight and white pine blister rust, which were brought into the United States around the turn of the century. The former destroyed our most valuable native hardwood species, and the latter decimated white pine stands from New England to the Pacific Northwest. Before the advent of high-yield plantation forestry, fusiform rust of southern pines was not much of a problem. Now it is causing over \$128 million a year in damage to southern forests.

Costs Must Be Low

The devastation of forest diseases is easy to recognize; the appropriate corrective action is less apparent. Although a forest may be worth a great deal, each individual tree in it is worth little. Even in the South, where